

The altruism of biodiversity exploration expeditions

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This is the second issue of *Zoosystema* specifically dedicated to zoological results of the SANTO 2006 Global Biodiversity Survey. In the meantime, *The Natural History of Santo* (Bouchet *et al.* 2011) has been published, and formally presented in June 2011 to the authorities of Vanuatu in Port Vila and to the customary chiefs of Santo in Luganville. To administrators, decision makers and managers, that volume will probably be seen as the culmination of the publication of the results of the expedition. Yet, to academics, *The Natural History of Santo* is perhaps no more than an interim report, rather than the synthesis of specialist research articles. As emphasised in the foreword to the first *Zoosystema* Santo issue (Bouchet *et al.* 2009), the tempo of academic research publications is not the same as the tempo of conservation action.

Special journal issues are excellent showcases for the sponsors of the expedition and the authorities of Vanuatu. However, they may not be the first choice of scientists when they want to publish

their results. In fact, it is natural that authors will want to publish in specialist journals, and it is also good for the visibility of SANTO 2006 that expedition results are disseminated throughout the scientific literature. Considering just new species descriptions, these have been published in no less than 25 journals. Of these, 15 are specialist/taxon journals: *Acta Entomologica Musei Nationalis Pragae* (Besucher & Hlaváč 2011), *Aquatic Insects* (Malzacher & Staniczek 2007), *Arthropoda Selecta* (Golovatch *et al.* 2008), *Crustaceana* (Naruse *et al.* 2009), *Crustaceana Monographs* (Galil & Ng 2010), *Entomologische Zeitschrift* (Gerstmeier & Schmidl 2007), *Gloria Maris* (Malcolm & Terryn 2012), *Journal of Molluscan Studies* (Brenzinger *et al.* 2011), *Journal of Phycology* (Payri & Verbruggen 2009), *Miscellanea Malacologica* (Faber 2011), *Neue Entomologische Nachrichten* (Eitschberger & Schmidl 2007), *Phycological Research* (N'Yeurt & Payri 2008, 2009), *Ruthenica* (Fedosov 2011), *Visaya* (Terryn & Holford 2008), *Vita Malacologica*

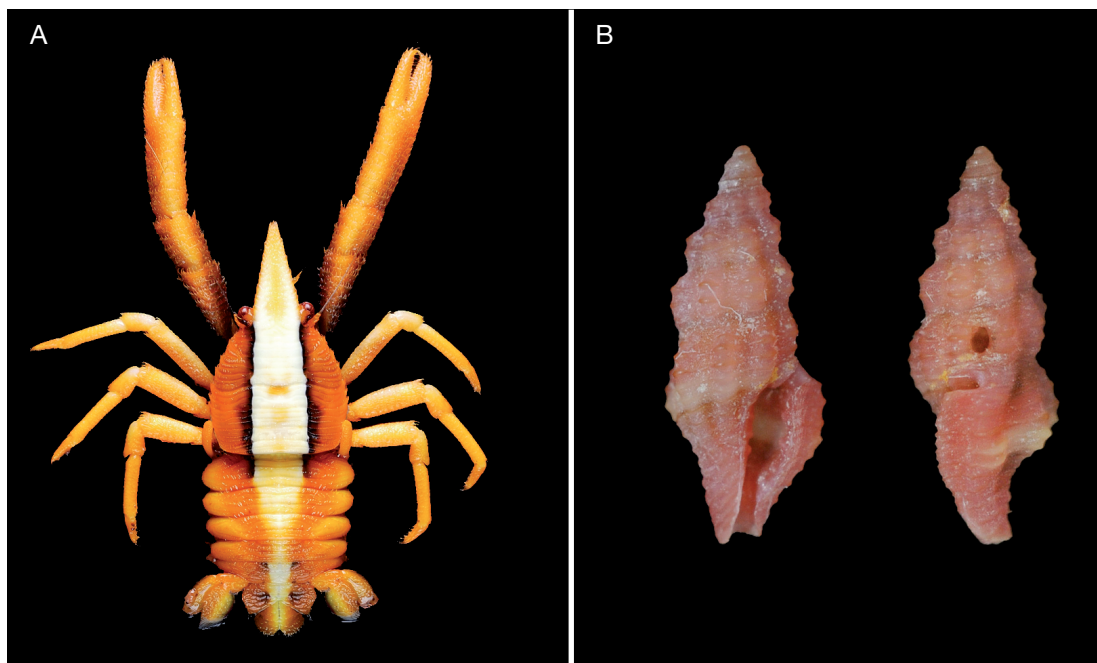


FIG. 1. — **A**, *Allogalathea babai* Cabezas, Macpherson & Machordom, 2011 (Decapoda, Galatheidae), ovigerous female, 8.4 mm (MNHNGa7354, Allo8); **B**, *Lienardia roseangulata* Fedosov, 2011 (Conidae, Gastropoda), 4.6 x 1.9 mm (MNHN 24440, IM-2009-18091). Photographs: A, T.-Y. Chan; B, A. E. Fedosov.



FIG. 2. — **A**, *Lepidodactylus buleli* Ineich, 2008 (Reptilia, Gekkonidae), male holotype (MNHN 2008.0004); **B**, *Vanuatiella tishechkini* Besuchet & Hlavac, 2011 (Coleoptera, Staphylinidae). Scale bar: 1 mm. Photographs: A, I. Ineich; B, A. Tishechkin.

(Ter Poorten 2009); a further 10 are generalist journals: *Hydrobiologia* (Haase *et al.* 2010), *PLoS ONE* (Neusser *et al.* 2011), *Proceedings of the Biological Society of Washington* (McLaughlin & Rahayu 2008), *Raffles Bulletin of Zoology* (Yang *et al.* 2008),

Stuttgarter Beiträge zur Naturkunde A (Gattolliat & Staniczek 2011), *ZooKeys* (Roisin 2011), *Zoological Journal of the Linnean Society* (Cabezas *et al.* 2011), *Zoological Science* (Kantor *et al.* 2008), with the lion's share being *Zoosystema* (Bamber 2009;

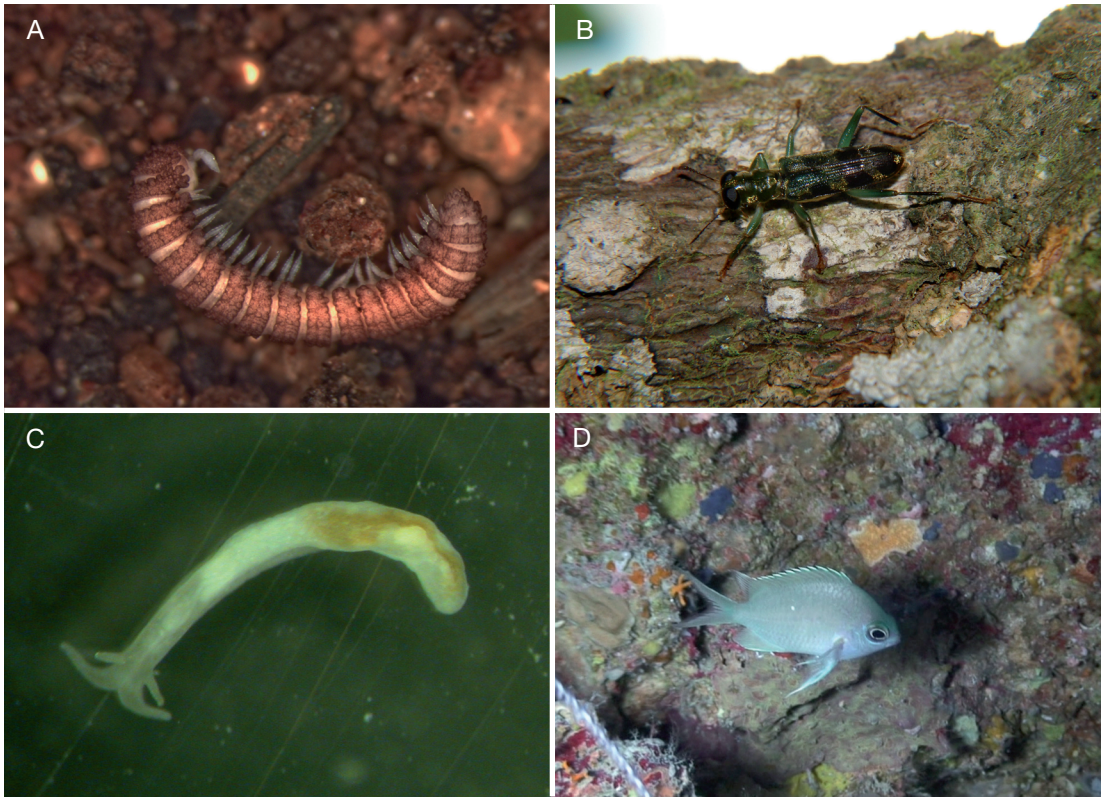


FIG. 3. — **A**, *Lobiferodesmus vanuatu* Golovatch, Geoffroy, Mauriès & VandenSpiegel, 2008 (Diplopoda, Polydesmida); **B**, *Omadius santo* Gerstmeier & Schmidl, 2007 (Coleoptera, Cleridae); **C**, *Pseudunela marteli* Neusser, Jörgen & Schrödl, 2011 (Gastropoda, Acochlidia); **D**, *Chromis earina* Pyle, Earle & Greene 2008 (Perciformes, Labroidei, Pomacentridae). Photographs: A, L. Deharveng; B, J. Schmidl; C, T. Neusser; D, J. L. Earle.

Desutter-Grandcolas 2009; Hugel 2009; Jaume *et al.* 2009; Keith *et al.* 2009; Lane & Rowe 2009; Lourenço 2009; Macpherson 2009; Neusser *et al.* 2009; Ober & Stanicek 2009; Olmi & Villemant 2009; Pauly & Villemant 2009; Plant & Daugeron 2009; Robillard 2009; Tishechkin 2009; Wahis *et al.* 2009; Weiner *et al.* 2009) and *Zootaxa* (Jaume & Queinnec 2007; Ng & Manuel-Santos 2007; Ng & Naruse 2007; Ineich 2008; Pyle *et al.* 2008; Cabezas *et al.* 2010; Couri *et al.* 2010; Shih *et al.* 2010; Yang *et al.* 2010). Although the discovery and description of new species was, admittedly, one of the goals of the expedition (a little sample is given in Figures 1-3), it by no means was not the only one. In fact, the SANTO 2006 expedition generated much molecular material that is fueling

regional (e.g., Pillon *et al.* 2009; Nattier *et al.* 2011; Buerki *et al.* 2012; Plunkett & Lowry 2012) or global phylogenies (e.g., Chan *et al.* 2010; Martin Lescanne *et al.* 2010; Williams *et al.* 2010; Lai *et al.* 2011; Puillandre *et al.* 2011). It also generated biological (e.g., Robillard *et al.* 2007; Fedosov 2007; Lord *et al.* 2010; Volland *et al.* 2010), ecological (e.g., Samadi *et al.* 2007; Kano 2009; Ineich 2010; Albano *et al.* 2011), and of course faunistical (e.g., Richer de Forges & Ng 2008, 2009; Castro 2009; Thibaud 2009; Zhang *et al.* 2009) and floristical (e.g., Mattio *et al.* 2010) data. To date, exactly 114 specialist research publications based on, or using, material collected during the expedition have already been published, counting the 14 in the present issue of *Zoosystema* (Boxshall & Jaume

2012; Brothers 2012; Desutter-Grandcolas 2012; Dijkstra & Maestrati 2012; Flecks *et al.* 2012; Hoeksema 2012; Hugel 2012; Macpherson 2012; McLean 2012; Narvaez & Robillard 2012; Séret & Last 2012; Soldati *et al.* 2012; Villemant *et al.* 2012a, b), including the description of 98 new species of which 15 are described here (for a complete list, see the Appendix). By traditional standards, this is already a respectable achievement. However, the success of the SANTO 2006 expedition should not be judged only on a list of academic publications. In fact, we would like to argue that it would be wrong to evaluate the “return on investment” of the expedition based on such criteria.

Because of the funding and evaluation culture of research councils and granting agencies, most academic field work for biodiversity research is carried out on a small to very small scale. Typically, one or a few persons spend some weeks in the field and collect a volume of biological samples that can fit in a backpack or suitcase, and fits a narrow aim of research. Typically also, the same persons who collected the material will also study it, authoring/co-authoring the resulting papers. This is because funding/research organisations usually allocate funds nominally to a Principal Investigator on the basis of a peer-reviewed, hypothesis-driven, research proposal. In such a proposal, the success of the project will be judged on the publications authored by investigators funded by the grant. Field work will thus be very focused, depend on the PI's expertise for collecting data (specimens, biological observations), and typically do not represent the totality of requested funding. As a result of these competitive evaluation/funding procedures for peer-reviewed, hypothesis-driven, research proposals, biodiversity exploration and taxonomic work – especially on invertebrates – are the eternal losers. One may legitimately ask whether this is a strategy appropriate for documenting global biodiversity in the age of the sixth extinction. Robert Mesibov introduced the concept of “biodiversity salvage”, on the model of “archeology salvage” (Mesibov 2004). In the same way that archeological salvage excavations document what is going to be destroyed by the construction of dams, highways or other large infrastructure, Mesibov suggested that a massive biodiversity salvage

programme should sample invertebrates – the “losers” – before they become extinct. A biodiversity salvage programme will not stop extinction and cannot replace direct observations of the biological attributes of the species, but it will at least salvage in museum collections specimens of at-risk invertebrates, for the vast majority of which there will never be an Action Plan, a conservation programme, or a specially designated protected area. Many taxonomic groups collected during the SANTO 2006 expedition do not have a specialist and may not be studied before 20 or even 50 years. By then, the environment of Espiritu Santo may have been profoundly modified by aliens, agricultural development and real estate speculation: SANTO 2006 will perhaps be seen in the future as a “biodiversity salvage” expedition.

Collecting for the future, and also collecting for others. The SANTO 2006 expedition brought to the field 154 participants, who were professional or non professional scientists, in order to fulfill two main aims: first, sampling widely the biodiversity of Espiritu Santo Island, and second, focussing on particular taxa or questions. Of the 172 authors and co-authors of the resulting academic research papers published so far, 28% were expedition participants – and thus 72% were not. An important take-away message from the expedition is that, if you want to think big, you must be altruistic. Samples have been studied by specialists who – for the most part – did not take part in the expedition: their “right to study” is determined by their taxonomic skills and capacity to publish results in a timely fashion. Specimens' ownership, in turn, is determined by the responsibilities that institutions agree to bear, not only to the scientific community, but more importantly to the host country where the research is conducted. When the Muséum national d'Histoire naturelle (MNHN) signed with the Ministry of Lands of the Government of Vanuatu the Memorandum of Understanding under which the expedition was to be conducted, it acted on behalf of the participating scientists from 40 institutions. When it comes to reporting, the MNHN alone is responsible for reporting to the Government of Vanuatu – and the counterpart of this responsibility is that most research collections resulting from the expedition are lodged with MNHN.

The economic and logistical model of SANTO 2006 was thus one of altruistic, large-scale, sampling funded as such by private foundations, with a dose of traditional, small-scale, research funded by academia. As time passes, new publications will keep rolling in, but the necessity to showcase the results of the expedition will diminish. The present issue of *Zoosystema* may thus be the last one specifically dedicated to Santo, and this is probably a good time and place to express again our gratitude to all the sponsors, benefactors and institutions who made the expedition possible: their logos on the page facing the title page of this volume is an expression of this fruitful partnership.

Philippe Bouchet,
Hervé Le Guyader,
Olivier Pascal,
Directors, SANTO 2006 expedition

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APPENDIX

New species described based on SANTO 2006 expedition.

VERTEBRATA

- Chromis brevirostris* Pyle, Earle & Greene, 2008
[Pisces; holotype from Caroline Island]
Chromis earina Pyle, Earle & Greene, 2008 [Pisces]
Gehyra georgopotthasti Flecks, Schmitz, Böhme, Henkel & Ineich, 2012 [Reptilia; holotype from Loyalty Islands]
Lepidodactylus buleli Ineich, 2008 [Reptilia]
Notoraja inusitata Séret & Last, 2012 [Pisces]
Notoraja longiventralis Séret & Last, 2012
[Pisces; holotype from Fiji]
Stiphodon mele Keith, Marquet & Pouilly, 2009
[Pisces; holotype from Efate]

ECHINODERMATA

- Asterodiscides bicornutus* Lane & Rowe, 2009

MOLLUSCA

- Bathytoma carnicolor* Puillandre *et al.*, 2010
[Gastropoda; holotype from Solomon Islands]
Cyclochlams aperta Dijkstra & Maestrati, 2012
[Bivalvia]
Fluviopupa espiritusantoana Haase, Fontaine & Gargominy, 2010 [Gastropoda]
Fluviopupa melissae Haase, Fontaine & Gargominy, 2010 [Gastropoda]
Fluviopupa narii Haase, Fontaine & Gargominy, 2010 [Gastropoda]
Fluviopupa pascali Haase, Fontaine & Gargominy, 2010 [Gastropoda]
Fluviopupa priei Haase, Fontaine & Gargominy, 2010 [Gastropoda]
Fluviopupa snel Haase, Fontaine & Gargominy, 2010 [Gastropoda]
Fluviopupa walterlinii Haase, Fontaine & Gargominy, 2010 [Gastropoda]
Frigidocardium helios Ter Poorten & Poutiers, 2009 [Bivalvia]
Iotyrriis devoizei Kantor, Puillandre, Olivera & Bouchet, 2008 [Gastropoda]
Iotyrriis musivum Kantor, Puillandre, Olivera & Bouchet, 2008 [Gastropoda]
Lienardia roseangulata Fedosov, 2011 [Gastropoda]
Liotipoma magna McLean, 2012 [Gastropoda]
Micropecten excuratus Dijkstra & Maestrati, 2012 [Bivalvia]

- Myurella lineaperlata* Holford & Terry, 2008 [Gastropoda]
Pseudunela espiritusanta Neusser & Schrödl, 2009 [Gastropoda]
Pseudunela marteli Neusser, Jörger & Schrödl, 2011 [Gastropoda; holotype from the Solomons]
Strioterebrum illustre Malcolm & Terry, 2012 [Gastropoda]
Srrubellia wawnai Brenzinger, Neusser, Jörger & Schrödl, 2011 [Gastropoda; holotype from the Solomons]
Zebina striaticcallosa Faber, 2011 [Gastropoda]

CRUSTACEA

- Allogalathea babai* Cabezas, Macpherson & Marchordom, 2011 [Decapoda; holotype from New Caledonia]
Allogalathea inermis Cabezas, Macpherson & Marchordom, 2011 [Decapoda; holotype from New Caledonia]
Euclosiana guinotae Galil & Ng, 2010 [Decapoda]
Exosphaeroides quirosi Jaume & Queinnec, 2007 [Isopoda]
Galathea raventosae Macpherson, 2012 [Decapoda]
Galathea sanctae Macpherson, 2012 [Decapoda]
Heterocarpus corona Yang, Chan & Chu, 2010 [Decapoda]
Liagore pulchella Ng & Naruse, 2007 [Decapoda]
Macrolabrum mansoris Bamber, 2009 [Tanaidacea]
Munida jubata Macpherson, 2009 [Decapoda]
Munida mica Macpherson, 2009 [Decapoda]
Munida pauxilla Macpherson, 2009 [Decapoda]
Munida squarrosa Macpherson, 2009 [Decapoda]
Pagurapseudes queirozi Bamber, 2009 [Tanaidacea]
Paramunida ascella Cabezas, Macpherson & Machordom, 2010 [Decapoda]
Paramunida spica Cabezas, Macpherson & Machordom, 2010 [Decapoda]
Petrartus holthuisi Yang, Chen & Chan, 2008 [Decapoda; holotype from the Philippines]
Pumilopagurus tuberculomanus McLaughlin & Rahayu, 2008 [Decapoda]
Raymunida vittata Macpherson, 2009 [Decapoda]
Sadayoshia inermis Macpherson & Baba, 2010 [Decapoda; holotype from Solomon Islands]
Sadayoshia lipkei Macpherson & Baba, 2010 [Decapoda; holotype from Austral Islands]
Sadayoshia tenuirostris Macpherson & Baba, 2010 [Decapoda; holotype from Solomon Islands]

- Seborgia sanctensis* Jaume, Sket & Boxshall, 2009
[Amphipoda]
Serpenhusa brucei Naruse, Castro & Ng, 2009
[Decapoda]
Uca jocelynae Shih, Naruse & Ng, 2010
[Decapoda; holotype from Taiwan]
Vultocinus anfractus Ng & Manuel-Santos, 2007
[Decapoda; holotype from the Philippines]

INSECTA

- Amphibologyrrylacris butmasi* Hugel, 2009 [Orthoptera]
Ancistrotilla azurea Brothers, 2012 [Hymenoptera]
Anoplius santo Wahis, Durand & Villemant, 2009
[Hymenoptera]
Anteon molisae Olmi & Villemant, 2009 [Hymenoptera]
Brevizacla melissae Desutter-Grandcolas, 2012
[Orthoptera]
Caenis vanuatensis Malzacher & Staniczek, 2007
[Ephemeroptera]
Cardiodactylus tankara Robillard, 2009 [Orthoptera]
Ceratobister vanuatu Tishechkin, 2009 [Coleoptera]
Chlamydopsis caterinoi Tishechkin, 2009 [Coleoptera]
Cophonemobius faustini Desutter-Grandcolas, 2009
[Orthoptera]
Cryptotermes penaoru Roisin, 2011 [Isoptera]
Dichaetomyia univittata Couri, Pont & Daugeron,
2010 [Diptera]
Eucurtiopsis corbarai Tishechkin, 2009 [Coleoptera]
Eucurtiopsis degallieri Tishechkin, 2009 [Coleoptera]
Eucurtiopsis ibisca Tishechkin, 2009 [Coleoptera]
Eucurtiopsis kitchingi Tishechkin, 2009 [Coleoptera]
Eucurtiopsis pascali Tishechkin, 2009 [Coleoptera]
Eucurtiopsis penaoru Tishechkin, 2009 [Coleoptera]
Friesea santo Weiner, Bedos & Deharveng, 2009
[Collembola]
Kryptosega muweramwera Villemant, 2012
[Hymenoptera]
Labiobaetis paradisi Gattiolat & Staniczek, 2011
[Ephemeroptera]
Lasioglossum vanuatu Pauly & Villemant, 2009
[Hymenoptera]
Lebinthus nattawa Robillard, 2009 [Orthoptera]
Lebinthus santoensis Robillard, 2009 [Orthoptera]
Megacris lipsae Desutter-Grandcolas, 2012
[Orthoptera]
Melanagenia penaoru Wahis, Durand & Villemant,
2009 [Hymenoptera]
Omadius santo Gerstmeier & Schmidl, 2007
[Coleoptera]
Phaloria faponensis Desutter-Grandcolas, 2009
[Orthoptera]
Phaloria walterlinii Desutter-Grandcolas, 2009
[Orthoptera]
Phyllodromia variabilis Plant & Daugeron, 2009
[Diptera]
Pseudotrignidium personatum Desutter-Grandcolas,
2009 [Orthoptera]
Psilogramma vanuatu Eitschberger & Schmidl, 2007
[Lepidoptera]
Psilogryllacris tchancha Hugel, 2009 [Orthoptera]
Uloma vanuatensis Soldati, 2012 [Coleoptera]
Vanuatiella tishechkini Besuchet & Hlaváč, 2011
[Coleoptera]
Vanuatubasis santoensis Ober & Staniczek, 2009
[Odonata]
Xylophion sevrapek Villemant, 2012 [Hymenoptera]

OTHER ARTHROPODA

- Lobiferodesmus vanuatu* Golovatch, Geoffroy,
Mauriès & VandenSpiegel, 2008 [Myriapoda]
Lychas santoensis Lourenço, 2009 [Scorpiones]

OTHER INVERTEBRATES

- Sandalolitha boucheti* Hoeksema, 2012 [Cnidaria]

ALGAE

- Chondria bullata* N'Yeurt & Payri, 2009
[holotype from Tuamotus]
Pseudocodium mucronatum Payri & Herbruggen, 2009
[holotype from New Caledonia]
Sebdenia cerebriformis N'Yeurt & Payri, 2008
[holotype from Fiji]